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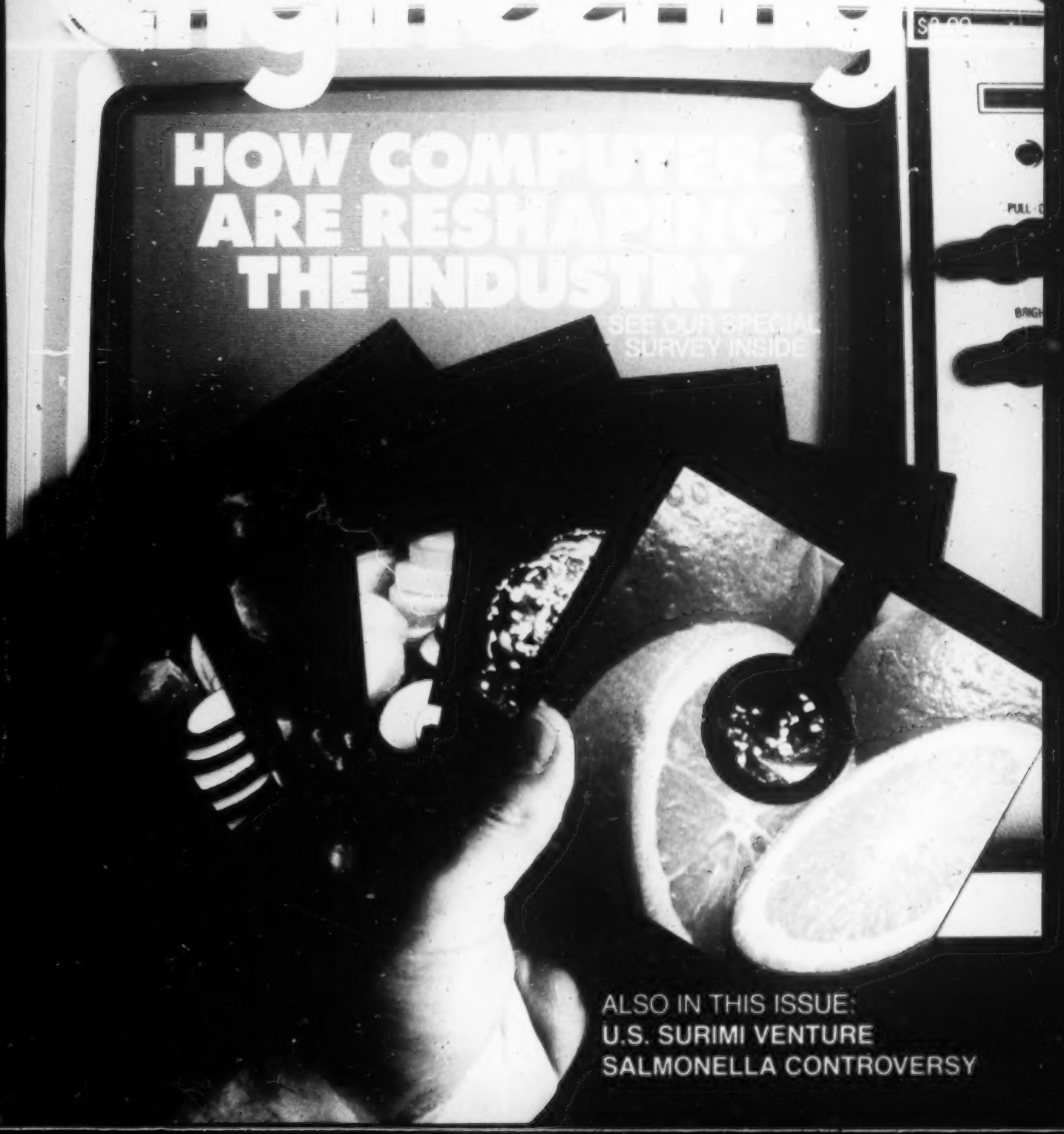
Chilton's food packaging
JUNE 1985

In this issue:
FOOD PACKAGING

HOW COMPUTERS ARE RESHAPING THE INDUSTRY

SEE OUR SPECIAL SURVEY INSIDE



ALSO IN THIS ISSUE:
U.S. SURIMI VENTURE
SALMONELLA CONTROVERSY

Chilton's Food Engineering

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POSTMASTER: Send form 3579 to Food Engineering, Post Office Box Number 1452, Riverton, N.J. 08077.

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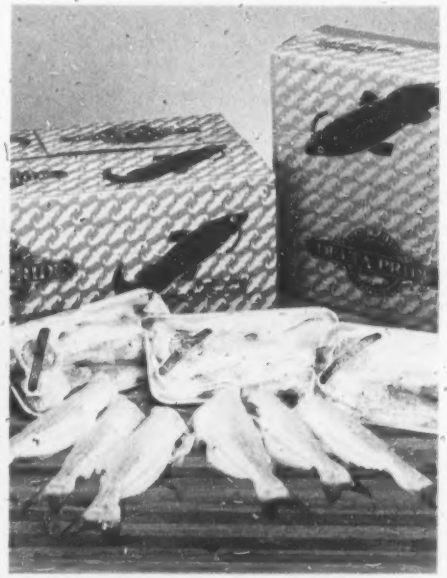

MISSISSIPPI CATFISH: Since 1975, catfish consumption in the United States has grown at a rate of 30% per year. **PAGE 118**

Special Emphasis

HANDLING & DISTRIBUTION:
Special focus is given to Handling equipment in this month's new product section.
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In April, *Food Engineering* probed the food industry's thoughts on computers. We surveyed 220 food companies, asking detailed questions on how they use computers, how would they *like* to use computers, what kinds of computers would they buy, and so on. As far as we can determine, this is, to date, the most thorough assessment of the future for computers in the food and beverage industries.

We found an industry that has accepted the idea that computers will play a dominate role in the way it produces food products.

One particular survey typifies how food companies are changing. It was completed by a food technologist working for a small fruit processor. He didn't answer many questions, so all we know about his company is everything is done by hand and there are no plans to change.

We also know his is the stereotypical food plant. It doesn't automate, it hires more people. It doesn't need a computer, just a clerk with a dozen sharp pencils. Yet even in this environment he thought it necessary to write a single, terse sentence: "Our company is behind the times."

The food industry is like our food technologist. It knows it has some catching up to do. And it's turning to computers for help.

But also like our food technologist, the industry knows change doesn't happen overnight. From the survey we know computerization is moving at a carefully measured pace.

We also know why. Companies are not automating just for the sake of automation. They are waiting for intrepid people to find justifiable applications. Computers are accepted by the industry, but they are not reshaping it. People like our observant technologist are.

Survey result: Everyone uses computers

According to the survey, an overwhelming majority of food plants now have computers.

Of the 220 people who returned the survey, 92.3% said they use some form of computer, be it a personal computer, programmable controller, "smart" lab instrument, or process controller. Only 16 said they did not. (A computer, as defined in the survey, is anything with a microprocessor).

The survey pointed out other trends as well. Food companies are spending money on computers. Asked, *"How much will your company spend on computers this year?"* 33% said over $100,000. Seventeen percent said $50,000 to $100,000.

Food companies want to be more automated. To the question, *"On a 1-10 scale, 1 meaning hand labor, 10 meaning robots, how automated are you?"* the average reply was 4.7. To the question, *"How automated should you be?"* the average reply was 7.2. Only one person answered that his or her company was too automated.

People are satisfied with their computer's performance. Eighty-eight percent said computers have performed up to expectations or better. Only 12% replied that computers have performed inconsistently. Only two said computers were disastrous.

People perceive the food industry as becoming computerized. Asked, *"What percentage of food plants use computers?"* most people replied 41-60%. The next largest response was 61-80%. Few people replied 0-20%, and those that did tend to be less computerized themselves.

Why now?

We interviewed several survey respondents by phone to confirm these results. From the interviews, we know food companies have computers, but they are only starting to learn what computers can do. Like the Cheshire Cat, the stereotypical food plant is disappearing, but it will take time to fade completely.

Why is it fading at all? Why after years of clinging to tried-and-true methods are notoriously conservative food companies using computers?

From the survey and the interviews, we found two forces at work. One, food company management is starting to face intense competition. Not that competition hasn't been there all along. It's just that food companies have not been under the same market pressure as industries such as electronics or petrochemical.

Witness cookie wars, beer wars, and now the onset of cola wars. Moreover, foreign competitors are coming. A Japanese soup company is rumored to be moving to California. In seafood, the Japanese have already established a "beachhead" with surimi.

As competition is felt more strongly, food companies will react the same way as other industries. They will try to cut production costs. Computers are one way to do that. A mechanical engineer wrote, "I feel the food industry is years behind in computer applications, but that conversion to many computer uses will be necessary to stay competitive."

The other force pushing computers into food plants comes from the electronics industry itself. Manufacturers now have systems for computer novices, at a reasonable cost. The development of a powerful microprocessor is another factor. Programmable controllers were once sophisticated on/off switches. Now, they are approaching the power of a microcomputer.

A distinct pattern

The survey and interviews produced a paradigm that describes how food plants computer-

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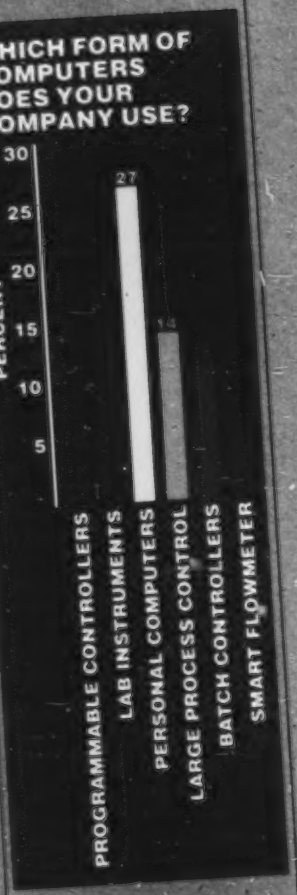
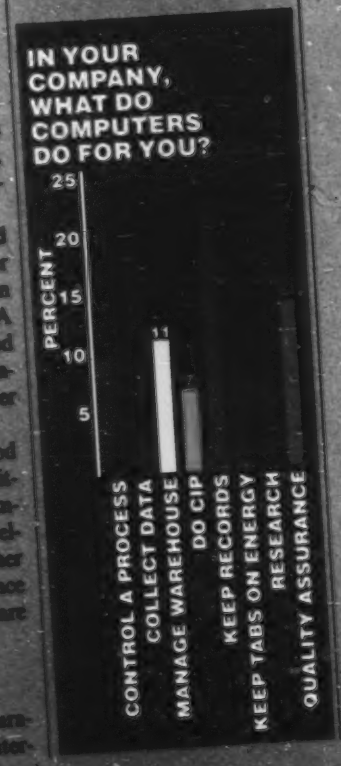


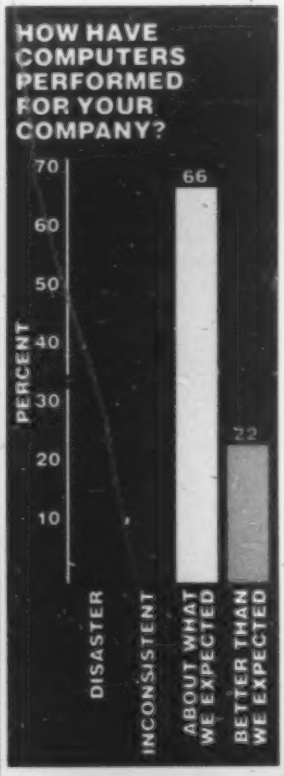


ize. See if your company fits the mold.

It's a slow process, taking from one to three years. First installed are one or two programmable controllers or personal computers. Neither has much to do with processing itself: programmable controllers manage a palletizer or freezer, for example. Personal computers end up in offices or labs, sometimes on the plant manager's desk. They keep track of inventory, sales orders, sometimes production statistics, but they don't touch processing itself.

Then people find out these computers can do more. Others are installed. More software is purchased. More responsibilities are delegated, maybe even some small processing tasks. This is where the industry is right now.

Once familiar with computers, a food company is ready for the Big Step. It connects its programmable controllers together with some form of display terminal, maybe a personal computer or a large process control system.



What kind of computers do food plants use?

According to the survey, most companies are not interested in full-blown process control. The survey asked, "What kinds of computers do you use?" The two largest responses were *personal computers* (27%), and *programmable controllers* (25%). Next came *lab instruments* (18%), *large process control systems* (14%), *batch controllers*, (12%) and *smart flowmeters* (5%). Two people wrote that they were using mainframe computers.

It's understandable that personal computers and programmable controllers are most widely used. They are relatively inexpensive. They are also easy to apply. It's far easier to automate a palletizer than an entire packaging line.

Microprocessor developments are partly responsible for lab instruments ranking so high. Five years ago, much was done by hand. The microprocessor has taken on the work of a technician. It also has improved precision. Several people wrote comments similar to this QA manager: "I would like a more automated lab—less room for human error. I would also like to try and use least cost formulation for making the various sausages we do."

Look for even more automation in the lab. A good example of what is ahead is Perkin-Elmer Corp., Norwalk, CT. It introduced a lab system at the Pittsburgh Conference in New Orleans this year. Perkin-Elmer has brought robots and computers together in the lab. Its robots are not industrial grade—they only lift three pounds. But they are not extravagantly priced. The marriage could not be done without a personal computer and special software called PERL—Perkin-Elmer Robot Language. With the robot, sample handling will be completely automated. Test results will go straight to the personal computer for easy reference.

Computers make great clerks

At this point in time, computers are doing paperwork. To the question, "What do computers do for you?" the top two replies were *keep records* (22%) and *collect data* (18%). Fourteen percent replied they use computers for quality control. Other replies, in order, were: *manage the warehouse* (11%), *control an entire process* (10%), *keep tabs on energy* (9%), *assist product research* (8%), and *do CIP* (7%).

A subtle error popped up in this question. There was no "Control *part* of a process" answer box on the survey. Since there was no box to fill in, we don't know how many people use computers for managing small bits and pieces of a plant. We do know from the phone interviews that the majority of programmable controller are used for that purpose. We also know controllers rarely do process control. Nearly all applications are machine oriented: managing a palletizer, for example.

Another result confirmed that computers are managing information, not processing. In reply to, "Why did you install computers?" the most frequently checked answer was *gather data* (28%). Next came *save labor* (26%), *improve product* (17%), *replace old equipment* (12%), and *replace relays* (11%).

The theory that computers tend to be part of renovation projects didn't stand up. Only 6%, or 34 replies, said computers were installed as part of a renovation.

A surprising result was that computers are

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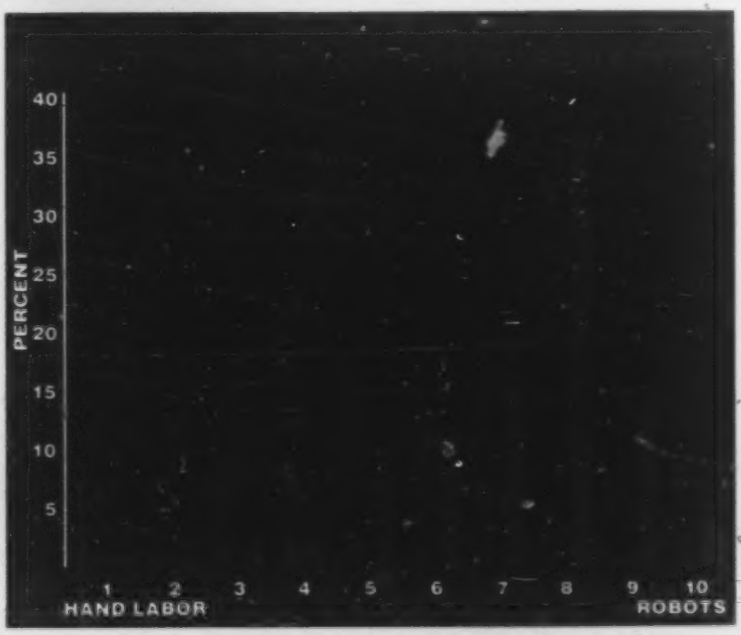
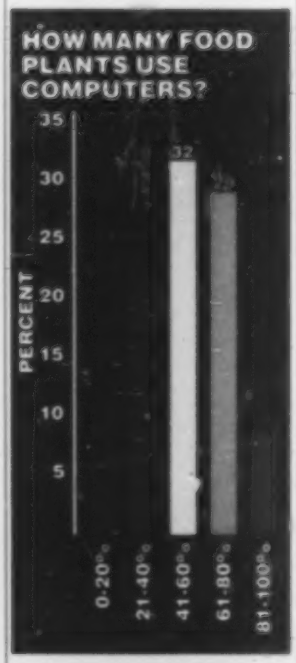
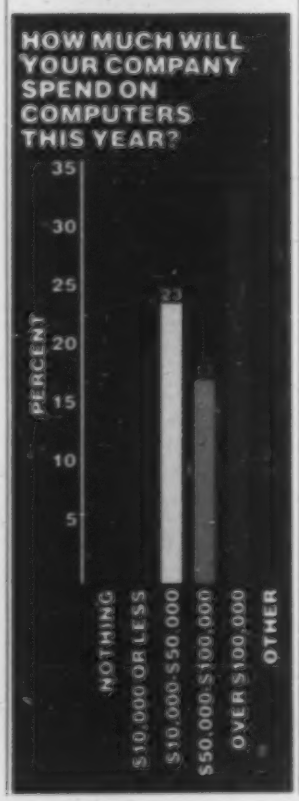


Photo on preceding page is a MYCRO Distributed Control System courtesy of Moore Products Co., Spring House, PA.

Respondents felt better than half of all food plants are computerized. Sixty-one percent estimated that 41-80% of all food plants use computers.





seldom used to replace relays. It turns out that food industry engineers look on computers as more than just relay replacers. Even programmable controllers are regarded as more than just a substitute for relay panels.

Are computers performing well?

To the question, "How have computers performed for your company?", only 13% expressed dissatisfaction. Only one person checked the answer box marked *disaster* and 23 *inconsistent*. Sixty-six percent checked *about what we expected*, while 22% marked *better than expected*.

Several people who checked the "inconsistent" box explained why. Problems stem from the software. A quality control director wrote, "Every system has its down moments. Garbage 'in' has profound effects." One purchasing manager wrote, "Computers have preformed better than the people who direct them." A project manager explained, "We are improving with experience. Too many changes are taking place."

How much will be spent?

In a way, how much a company is willing to spend on computers is also a measure of satisfaction. You spend money on what works, or at least what you expect to work.

The largest response came in the highest dollar category. Thirty-three percent said their company was spending over $100,000 on computers this year. Seventeen percent checked the $50,000 to $100,000 category. Twenty-three percent said $10,000 to $50,000. Nineteen percent said $10,000 or less. Only seven percent, 14 answers, said they planned to spend nothing on computers.

There is much room for interpretation. $100,000 is not a lot of money where computers are concerned. What's more, it can be broken down in dozens of ways. $100,000 can buy one medium-size process control system, ten small controllers, two "loaded" programmable controllers, a HPLC analyzer for the lab, and so on. What's important is the food industry is going to spend the money.

Common perceptions

The survey contained four questions about computer perceptions. We wanted to know if people feel food companies are becoming more automated, or is the behind-the-times stereotype justified?

Two questions went together. One was *"How automated are you?"* The other was *"How automated do you think you should be?"* People rated themselves on a scale from 1-10. A "1" was equivalent to hand labor, while a "10" meant automated to the point of using robots.

People didn't mince numbers. No one skipped the question and only a few gave a range—for example, one engineer wrote "6-8."

In answer to the first question, 64% felt their plant was in the middle of the automation scale. The average was 4.7.

In answering question two, everyone felt their plant should be more automated. The average was 7.2. Only one person felt his or her plant was too automated.

From 4.7 to 7.2 is a big jump, especially for a conservative industry. How people would accomplish this turned out to be an enormous shopping list. A quality control manager wrote, "More CRT's—one for every desktop. A central control tower to weigh out and add ingredients. A computerized version of the Babcock method for fat analysis." A purchasing manager in a sugar company wrote, "Terminals, laboratory robots, and automatic palletizers." A snack food engineer wanted to install an, "On-line data acquisition system to improve product quality."

Perceptions shape opinions

To the question, *"How many food plants use computers?"* most people answered between 41% and 60%. The next largest response was 61-80% followed by 21-40%. In other words, responses looked like the bell curve with most of the answers right in the middle.

How people perceive their own level of automation influenced how they saw the rest of the industry. That is, if they use a CRT, they believe other people do as well.

People who gave themselves a 1-3 on the automation scale felt 21-40% of all food plants use computers. People in the middle of the scale (4-7) felt 41-60% was a more realistic estimate. People who considered themselves very automated (8-10) felt between 61% and 80% of all food plants use computers.

No matter how people rated themselves, they wanted to be higher. Those on the low end of the automation scale hoped to reach the middle. Those in the middle hoped to reach the high end. Those in the high end wanted to go higher still—7's wanted to become 8's, 8's hoped to become 9's.

But are they helpful?

The survey asked recipients to finish this sentence: *"Computers are making today's food plants..."* Two replies received 80% of the answers. Forty percent answered *slightly more productive*. Another 40% said *less labor intensive*. No other answer came close.

Only one reply said computers are making the industry worse, not better off. People checked off 286 replies to that question, yet only one felt the food industry is not benefiting from computers. That's a conclusion in itself.

WHAT YOU SAID ABOUT COMPUTERS

In addition to written comments, we talked to survey respondents by phone. Computers certainly elicit lively conversation, not all of it favorable. People did verify most of the survey results. They felt the food industry may not be the most automated or computerized in the U.S., but it isn't on the bottom. And all felt computers are just beginning to influence food processing.

Dave Newhart
QA Supervisor
"We use programmable controllers to manage our batching systems. They also keep track of production records. But a more elaborate process control system? I don't think it would work here. We need to be more knowledgeable about our process before we could bring it under computer control.
"We are about as automated as we need to be right now—large process control wouldn't work with the people we employ anyway. It simply isn't justifiable."

I. Aaronson
Director of Engineer
"There are a lot of people out there who don't really know what a computer is. They try to do things with computers that aren't practical from a cost standpoint.
"We use a programmable controller on our palletizer. Repeatability and reliability are what I'm interested in. The PC's work just fine in that respect. I can't see the advantage in anything more complicated.
"I think we are like all food plants, in the middle as far as automation goes. The kinds of control we need is basically relay oriented. Sure, we *could* do things with a computer, but we haven't yet, and won't until we need to."

Charles A. Creswell
Engineer
"Programmable controllers have been used in several of our new process control schemes. What would be nice is a personal computer network connected to a mainframe computer for data analysis, routine calculations, etc. I wish we could do process analysis—have a statistics package on hand.
"We are getting close to full automation in our new plants, where things are starting at ground zero. Our older plant takes more time, of course. Personally, I think we should use process control wherever appropriate for new lines. Get as close to state-of-the-art as we can."

Brewery Project Engineer
(name withheld on request)
"Our plant is well-automated. Our packaging lines were first. Now, we are exploring total automation.
"I think most food companies follow the same pattern. First they automate their packaging lines, then move on to other areas. That's been our experience. Try it on something, if it works, move on."
"My impression is there is a great deal of potential for automation in food plants. In the past computers were not sophisticated enough.

Ed Pawlowski
Cad/Cam Supervisor
"I see the food industry not as the leader in automation, but not on the bottom, either. Food companies do not seem to have the same degree of cost-consciousness as other industries. But in the last few years competition has prompted food companies to stop dragging their feet. People see advantages to computers once they are installed.
"Our company is a prime example. We were once set in our ways, but now we're looking at many different kinds of computers. We have some brand-new programmable controllers here that we are experimenting with. And we're also using Cad/Cam systems for engineering work. Computer graphics help in design analysis."

Keith M. Giunta
QC Supervisor
"Our freezer is controlled by a programmable controller, but we don't use process control in any shape of form. I think we have a great application for it, though.
"We make cakes. Consumers like a hand-iced look and are willing to pay for it, so we have people on line doing nothing but icing cakes. I would like to develop some kind of mechanical arm or robot that would do the same thing. "I think the way to do it would be to program a computer with icing patterns. The computer would guide the robot so no two cakes look alike. If we could do it before the competition, we would really be in clover.
"I don't see many food companies being computerized. Too many managers think in terms of a one or two year payback. That's all right if you're a monopoly, if you don't have competition. Food companies must look beyond the immediate future if they're to stay profitable."

J.Brent Adair
Manager, Project Management
"We purchased a number of personal computers to see what they could do for us. I think the results speak for themselves. Using a 'look back' justification process the investment yielded a ROI of about 200%.
"If I had to purchase something it would be additional CAD (computer aided design)/drafting work stations with color and black three dimensional capability."

Project Engineer
(name withheld on request)
"I worked with the latest control methods at a new plant our mother company built recently, and I loved it. Now I'm in one of our least-modern plants. It's torture."

(Continued on next page.)

Robots and related equipment to replace people doing menial, boring jobs. This would also increase productivity.

--Project Engineer

Desk Top micro PC—$25,000. Software—$5,000. Custom Programming—$40,000. Programmable Controllers—$210,000. Remote controlled devices, sensors, and instruments—remainder.

--QC Manager

Process control equipment & recreation facility.

--Process Engineer

A system of personal computers, local area networks, and data highways to allow efficient communication between and within departments.

--Quality Systems Control/ Audit Supervisor

Building restoration and energy conservation methods.

--Plant Manager

A vacation retreat.

--Materials Manager

A data system that would gather laboratory data on various production lots, compare it to specification data and clear product to traffic for shipping.

--Corp. Quality Assurance Manager

Capital still must be spent on a cost/benefit basis and would be applied to most cost effective projects. Our location would definitely look at centralized control using computers to improve labor utilization.

--Technical Manager

Automated packaging equipment, automated processing equipment. If I had anything left over, I would buy an updated personal computer. Mine is too slow.

--Director of Purchasing

Company cars.

--Engineer

$500,000 is not enough for anything major--most likely some necessary office renovation.

--Purchasing Manager

Knowledge is the most expensive thing a growing company can buy. Our research lab works overtime, spending time and money with the possibility it will come up short. Yet more often than not a major breakthrough means better products, spending reductions, and capital gains. We would love to use computers more and rely less on guesses.

--Unsigned

HOW WOULD YOU SPEND $500,000?

The last question on the survey was, "Suppose you were told your company had $500,00 left over in its capital budget. You are to spend that sum any way you want, no questions asked. What would you buy?"

People had absolutely no trouble thinking up ways. So many replies came back we couldn't print them all. Here is a selection of the more interesting comments. Since anonymity was promised, names and companies are not listed.

1. Replace borderline small equipment (pumps, meters, etc.) with new generation hardware—otherwise, wait until it breaks.
2. For purely QC purposes (non-production), a state-of-the-art, high resolution X-ray inspection system to allow total inspection of all incoming goods, raw materials, and ingredients. It would screen out foreign objects while still in the original sealed container. I could stop 99% of my product complaints and ship material back to the supplier.

--Director of R&D/QC

Distributed control for evaporators and some programmable controllers for relay replacement.

--Mechanical Engineer

MIS type system with an engineering slant. This could monitor process performance, indicate problems early on, and aid in process optimization.

--Instrumentation Engineer

Securities.

--Senior Scientist

1. Upgrade remaining CIP systems with Klenzade MP-1800 systems. 2. Search and destroy all strip chart recorders not using 12-inch wide chart (Honeywell and Foxboro). 3. Cad system for draftsman (no particular system). 4. Expanded word processing (prefer IBM).

--Certification Engineer

Cogeneration and wastewater recycling equipment.

--Unsigned

More programmable controllers to extend our current use of them in selected plant areas.

--Plant manager

Market research study so we know what our customers want in the way of new and modified products. I would spend the rest of the money on R&D and marketing for those new products.

--Quality Manager

High-tech programmable lab analyzers. Personal computers. Modern production equipment with better product protection ability.

--Quality Control Manager

So many possibilities I can't decide.

--Supervisor

(Continued on page 67.)

Is there a difference between the use of relatively new personal computers and somewhat older programmable controllers in plant control systems? Absolutely not! In fact, they compliment each other and are proving to be ideal companions in our food plants.

Each has its advantages and each has its drawbacks when used for plant and process control. Fortunately, they tend to fill each other's shortcomings, and can provide very effective solutions to food plant needs. But still, even the combination is not the final solution. The recent survey by Food Engineering helps to point this out.

For example, the survey indicates 80% of all food plants are 12 years or older. This is the lifetime relative to the growth phase computers and control technology have gone through. It highlights the potential for improvement based on better control methods.

The trend has already started. Published data shows the food industry consumed only 7.2% of the total electronic controls and instrumentation sold in the U.S. However, the current growth rate is *twice* the average for such controls. It is clear that the early leaders are moving rapidly to apply advanced automation techniques.

The trend is not limited to only large companies. The survey shows 81% of all food plants have reached a nominal level of automation and they were satisfied with results to date. A scant 1% believed computerization was making plants too complicated. The vast majority, 73%, felt they needed to make a substantial improvement in the area of automation and computers. Two-thirds of the plants report that they are already using programmable controllers and personal computers.

Communication

The low-cost hardware available from the personal computer manufacturer provides an excellent means to enhance the benefits of the programmable controller. The personal computer is capable of communicating with most programmable controllers. Valuable production information goes into a device that is very good at manipulating a lot of data and displaying it on a color CRT in a meaningful way. Whereas a mimic panel is very difficult to change, the CRT can easily be updated to stay current with process operations. This is a big help in training new operators.

Although special software is required for the personal computers to do this, a growing number of companies recently introduced products, and many more will appear in the next year or two. These software packages for the most part, are quite easy to use, and well within the abilities of people working with plant controls.

AN EXPERT VIEW OF WHAT LIES AHEAD

The survey uncovered that food plants like programmable controllers and personal computers more than any other form of computer. We asked Hank Nystrom, Director for the Food and Beverage Industry, Industrial Systems Div., Texas Instruments Inc., to explain why. These are his comments about what we found, and what is coming in the very near future.

In addition to providing a color CRT screen in place of a mimic panel, the personal computer can also send new instructions or commands to a programmable controller. Typically this is done with a special keyboard designed for use in the plant area, rather than the standard keyboard from the supplier.

Personal computers, even the "hardened" versions, are not designed for the same environment as programmable controllers. The disk drives cannot withstand the dust, temperatures, or humidity of a food plant. Although this is a consideration, this should not rule out the use of a personal computer. In most cases, all that need be done is house the personal computer in a suitable enclosure.

The personal computer is beginning to find use as a viable, low-cost method of programming the programmable controller. Although not as rugged as dedicated programmers, the personal computer offers attractive benefits for the engineering office.

First, as software packages become available for major brands of programmable controllers, it is possible to program a variety of types with one piece of hardware. Secondly, when not programming, the personal computer serves a multiple role in the office. This may eliminate the need to purchase a second personal computer that may be used all the time.

Although in some cases the personal computer may not be as easy to use as a specialized programmer with labeled function keys, one will quickly learn how to apply it and the cost advantages will outweigh any minor inconvenience.

A final advantage to using personal computers with a programmable controller is the ability to generate reports from information inside the controller. The user survey reveals 20% of the plants use a programmable controller to help manage information.

As useful as it is, the personal computer is not the answer to all plant needs. Just as the programmable controller needs information, so does the personal computer.

Summary

- Programmable controllers provide the optimum solution to most food plant control needs.
- Personal computers can be used very effectively as operator work stations in place of operator control panels.
- Plant-wide networks are very important to gather information about plant operations and provide a high-level supervisory control system.
- Personal computers can serve as low cost-universal programmers for programmable controllers.

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